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Operating Instructions FR(MU)1000

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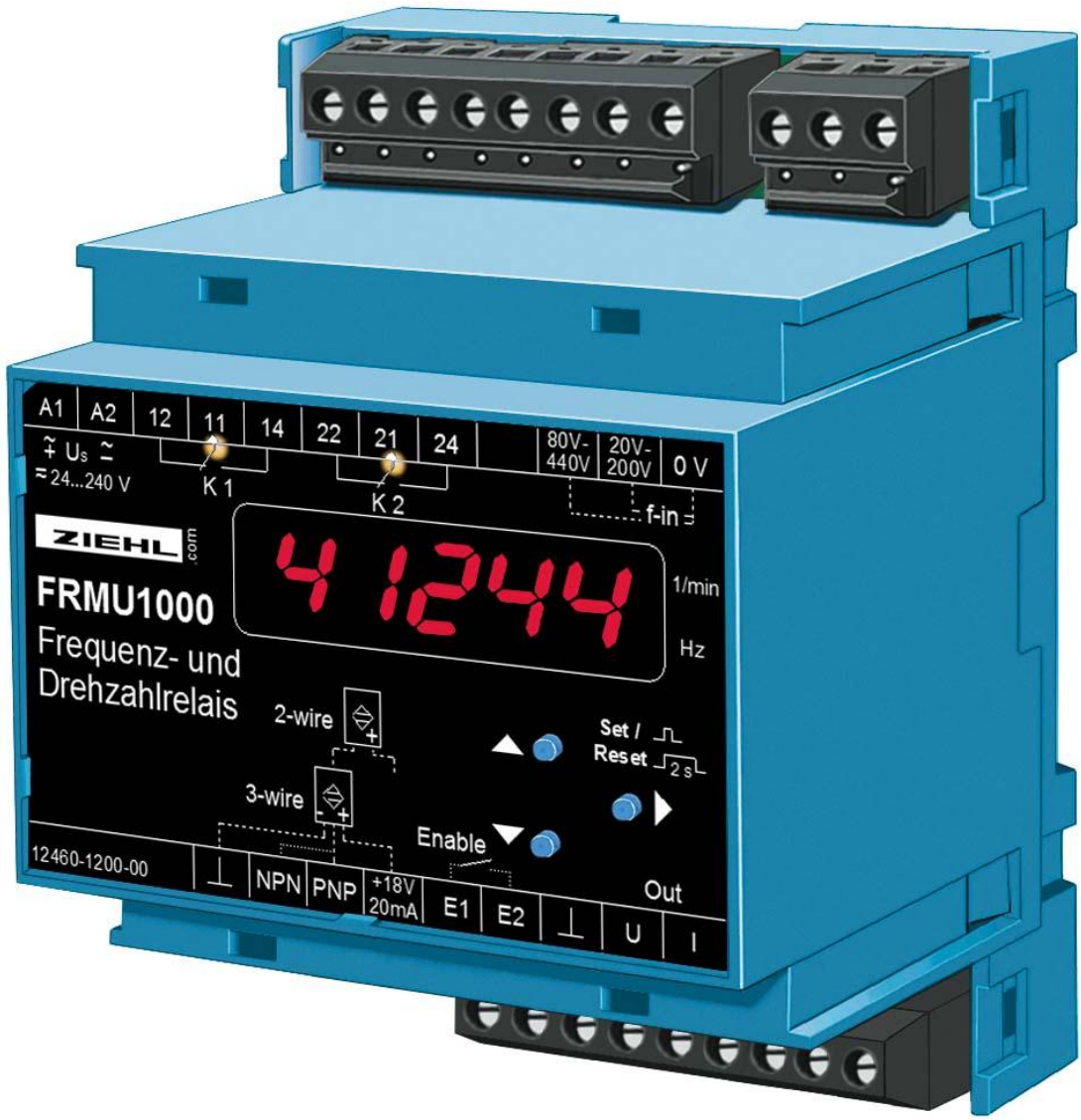
- Frequency- and Revolutions relay



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1 Application and short description

The FR(MU)1000 is a speed-monitor, a frequency-monitor and a measuring-transducer (FRMU only) in one device.
2 limits with 1 relay each can be programmed for under- or overspeed or under- or over-frequency or each monitoring a range (window min/max).
The input for monitoring of speed can evaluate signals from proximity-sensors 2- or 3-wire, npn or pnp. The display can be scaled. Thus the real speed of a shaft can be displayed, even though there are several pulses per revolution, e.g. from a cogwheel.
Application as Frequency-Relay:
Monitoring of frequencies in mains 16 2/3 to 400 Hz on maintaining a range (min/max).
Measuring input voltage (f-in) - AC 80...440 V / AC 20…200 V (Order-number U226134 + U226135)
- AC 210...830 V / AC 110…300 V (Order-number U226138)
Application as Speed-Relay:
Monitoring of overspeed or underspeed, each with pre-alarm and alarm, monitoring of maintaining a range (min/max) or monitoring of stop at machines and equipment, e.g. at conveyors, escalators or lifts or for monitoring drive-belts.
Applications as Measuring Transducer: (FRMU only)
In addition the FRMU1000 can be used as a measuring-transducer to convert the input-signal into a standard-signal 0/4-20 mA or 0-10 V.

2 Overview of functions

General:

- Setting in Hz or 1/min
- 5-digit display
- 2 limits / 2 relays
- Programmable for each relay:
  - monitoring of min.-, max.- or window
  - hysteresis
  - autoreset or reclosing lock
  - delay-time for switching and switching back down to 50 ms
  - operating- or closed-current-mode
- LEDs for state of relay and unit (Hz or 1/min)
- Storage of min- und max-values of the inputs
- Easy setting with 3 buttons
- Enable-input (E1-E2 closed = monitoring not active / open = monitoring active)
- Code lock against manipulation of settings
- Universal power supply unit AC/DC 24...240 V
- Terminals pluggable
- Analog output DC 0/4-20 mA or DC 0-10 V,
  freely scaleable (with isolation to frequency-input “f – in”), **FRMU only**

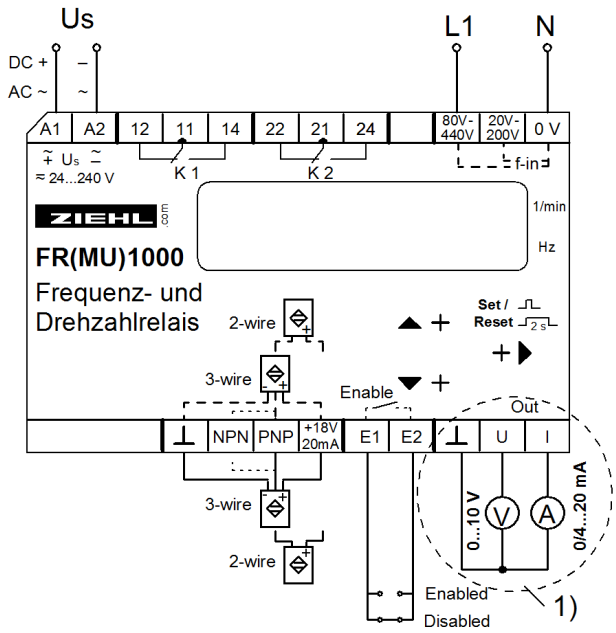
Frequency:

- Measuring input voltage - AC 80...440 V / AC 20…200 V (Order-number U226134 + U226135)
  - AC 210...830 V / AC 110…300 V (Order-number U226138)
- Measuring-input for ZIEHL frequency-sensor STWA 1 FFH
- Monitoring of frequency of own supply-voltage
- Monitoring range 10...500 Hz
- Resolution of display 0,01 Hz

Speed:

- Monitoring range 5...99999 1/min
- Display can be scaled
- Measuring input for proximity switch, 2- or 3-conductor, PNP or NPN
- Start-up-delay programmable
- Enable-input (E1-E2 closed = monitoring not active / open = monitoring active)

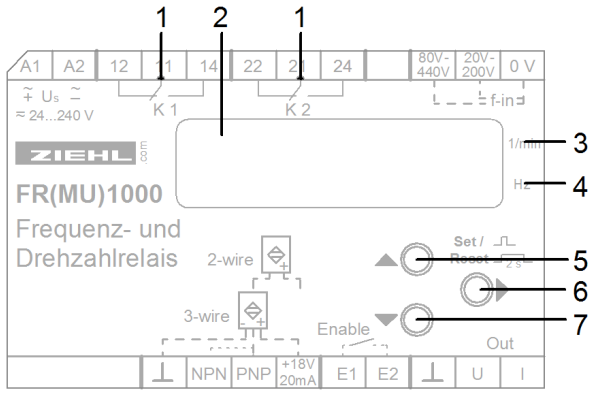
3 Connecting diagram



1) FRMU only

4 Display and operation parts

1	LEDs relay state
2	Digital display, 5 digits
3	LED speed measuring (1/min)
4	LED frequency measuring (Hz)
5	Pushbutton up
6	Pushbutton set/reset
7	Pushbutton down



5 Programs

2 programs (Pr) can be selected. Due to these Programs the device can be easily adapted to the application.
Choose the Program fitting to your application and after that change the parameters! When changing the program all parameters are reseted upon "factory setting".
(see chart " factory setting")

Selecting the program:
Keep the button "Set" pressed for 10 s when applying the supply voltage. Then program (Pr 1 ... Pr 2) can be choosen with the pushbuttons up/down and confirmed with set.

Pr 1 = Revolutions control (factory setting) (1/min)
Pr 2 = Frequency control (Hz)

6 Important Information

DANGER!
Hazardous voltage!
Will cause death or serious injury. Turn off and lock out all power supplying this device before working on this device.

To use the equipment flawless and safe, transport and store properly, install and start professionally and operate as directed.
Only let persons work with the equipment who are familiar with installation, start and use and who have appropriate qualification corresponding to their function. They must observe the contents of the instructions manual, the information which are written on the equipment and the relevant security instructions for the setting up and the use of electrical units.

The equipments are built according to DIN / EN and checked and leave the plant according to security in perfect condition. If, in any case the information in the instructions manual is not sufficient, please contact our company or the responsible representative.
Instead of the industrial norms and regulations written in this instructions manual valid for Europe, you must observe out of their geographical scope the valid and relevant regulations of the corresponding country.

Observe the maximum temperature permissible when installing in switching cabinet. Make sure sufficient space to other equipment or heat sources. If the cooling becomes more difficult e.g. through close proximity of apparatus with elevated surface temperature or hindrance of the cooling air, the tolerable environmental temperature is diminishing.

Attention!
When all relays are programmed in operation current mode (= pick up at alarm), a loss of the supply voltage or an instrument failure can remain unidentified. When the relay is applied as control instrument, the operator must ensure, that this error is recognized by regular examinations. We recommend to program and accordingly evaluate at least one relay in the closed-circuit current mode.

Universal power supply
The device has got a universal power supply, that is suitable for DC- and AC-voltages. Before connecting the device to supply-voltage make sure that the connected voltage corresponds with the voltage on the lateral type on the device.

7 Installation

The unit can be installed as follows:

- Installation in switchgear cabinet on 35 mm mounting rail according to EN 60715
- With screws M4 for installation on walls or panel. (additional latch included in delivery)
  Connection according to connection plan or type plate.

8 Putting into operation

Decimal point behind the last digit:

Off = display mode, displays values of measuring inputs
On = menu mode, select the menu items
blinking = parameter setting mode

8.1 Display mode

Indication of the current measured value

LEDs Relay (K1, K2)
ON = relay picked up
LED Speed (1/min) / Frequency (Hz)
ON = according program selected
Function button UP/DOWN
Push short change into menu mode
Push for > 2 s display of the stored MIN- or MAX-values of the choosen input
Function button SET/RESET
Push for 2 s Reset restart interlock
Push for 4 s display of the choosen program
Push for 10 s display of the software version

8.2 Menu mode (Decimal point behind the last digit ON)

Selection of the menu items for changing the parameters.
Function button UP/DOWN
Push short Selection of menu item; Change into display mode
Function button SET/RESET
Push short Change into parameter setting mode

8.3 Parameter setting mode (Decimal point behind the last digit BLINKS)

LEDs indicate relays concerned by the parameter setting.
Function button UP/DOWN
Press short/long Changement of parameter value (slow/fast)
Function button SET/RESET
Press short Acceptation of setting and choice of next parameters, after the last parameter change into menu mode

Selecting the inputs (I nPut):
Choose menu item with up/down until I nPut and type alternate in display.
Here it can be read, which input is selected.
Enter in programming with Set.
Select input with up/down and store with Set.

Multiplier/divisor (MuLt / di u) :
The indicated or limit value is calculated from the formula: input * MuLt / di u

Mean value (SuM):
Valid measured value = mean value from 1...8 (SuM) measuring cycles.

Setting the alarms (AL 1 / AL 2):
Choose menu item with up/down until AL 1 and limit (limit value) alternate.
Here it can be read clearly which limit value is programmed.
Begin to program with set.
Set limit with up/down and store with set. At window monitoring, this value is the lower limit of the window.
Choose function:
- oFF Alarm OFF, relay is released all the time
- ⌐¯L Overspeed / overfrequency without reclosing lock
- ⌐¯¯ Overspeed / overfrequency with reclosing lock. Reset only possible after signal is below the limit (with hysterisis) and after the switchback-delay. The switchback-delay is indicated with blinking „A 12L“ in the display.
- ¬_⌐ Underspeed / underfrequency without reclosing lock
- ¬__ Underspeed / underfrequency with reclosing lock. Reset only possible after signal is below the limit (with hysterisis) and after the switchback-delay. The switchback-delay is indicated with blinking „A 12L“ in the display..
- ⊣¯⊢ Window monitoring without reclosing lock.
- ⊣¯¯ Window monitoring with reclosing lock. Reset only possible after signal is within the window (with hysterisis) and after the switchback-delay. The switchback-delay is indicated with „A 12L“ in the display.

ALHi upper limit at window monitoring. Lower limit = AL 1 set limit.
Set Hysteresis
Alarm delay time dAL: An alarm is suppressed for this time, short-time exceeding of the limits does not cause an alarm.
Switch-back delay doF: Alarms are switched off this time after the signal has returned into good-state.
Function of relay:
- ⌐-Closed-current circuit mode. Relay is picked up in GOOD and releases when the limit is exceeded = alarm. Advantage: errors and faults normally cause an alarm. Disadvantage: alarm also when supply-voltage is switched off and after switching on until the relay has picked up.
- A- Operating-current mode: relay is released in GOOD state and picks up when the limit is exceeded. No alarm at errors and when supply-voltage is switched off.

Start-up-delay (dEnAb):
Monitoring starts this time after switching on the supply-voltage and after opening the enable -input E1-E2.

Display delay (ddi SP):
Defines the rate for updating the display. Set to higher values at nervous display.

Simulation (Si):
Here a measured input signal can be simulated with the buttons up/down. All functions of the device work as if this value was at the input. If no button is pressed for 15 minutes the device automatically switches back into the display mode.

Code-lock (CodE):
After setting all parameters they can be protected by activating the code lock. After pushing Set, the display indicates Pin.
Adjust with buttons up/down Pin 00504 (factory setting). After pushing Set, code lock can be activated or switched off. After pushing Set again, an individual Pin can be selected (write down).
When code lock is activated all parameters can be seen but not be changed anymore.
In case of problems with the code lock (forgotten Pin) the lock can be switched off and the Pin can be set back to 00504, by pushing button set while connecting the device to supply-voltage until Cod / oFF is indicated in the display.

Tips:

- With the pre-setting Pr1 and Pr2 the most important parameters can be set in advance, so that only little modifications are necessary , e.g. setting of the limits (limit values) for each alarm.
- When the right decimal point in the 7 segment display is on, the display mode has been left, and the menu items can be chosen with up/down (menu mode).
- When the right decimal point blinks, you are in the parameter setting mode and can change the setting with up/down.
- After finishing one menu item it is switched automatically on the next one.
- Long pushing on up/down speeds up the changes in the display.
- Pushing button up and down at the same time sets values to zero.
- With reset (press Set/Reset for 2s) the display mode can be reached from every position (exception: simulation) of the parameter setting mode (the last selected value in is being stored).

8.4 Indications of the digital display

Pr 1 / Pr 2	program number
A1 , A2	alarm 1 , alarm 2 active
A12	alarm 1 and alarm 2 active
+ L	alarm locked (locked), „reset“ is necessary.
dEn	remaining time until monitoring is activated (start-up-delay dEnAb is ending)
InPut	input
U1-U2	frequency input (f - in)
nPn	three wire proximity-switch NPN
PnP	three wire proxy-switch PNP or two wire proxy-switch
MuLt	multiplier
di u	divisor
SuM	mean value
AL 1, AL 2	alarm limit (lower limit when monitoring a window)
Func	alarm function
oFF	alarm off
⌐¯L	overspeed / over frequency without reclosing lock
⌐--	overspeed / over frequency with reclosing lock.
⌐_r	underspeed / under frequency without reclosing lock
⌐_-	underspeed / under frequency with reclosing lock
⊣¯⊢	window monitoring without reclosing lock
⊣¯-	window monitoring with reclosing lock
ALhi	upper limit when monitoring a window
H	hysterisis
dAL	switching-delay
doF	switch-back-delay
rEL	function of relay
r	closed-current mode, contacts 11-12 resp. 21-22 close at an alarm
A	operating-current mode, contacts 11-14 (21-24) close at an alarm
dEnAb	start-up-delay
ddi SP	display delay
on, oFF	on/off
Si	simulation
CodE	code (pin)
Pin	ex works 00504

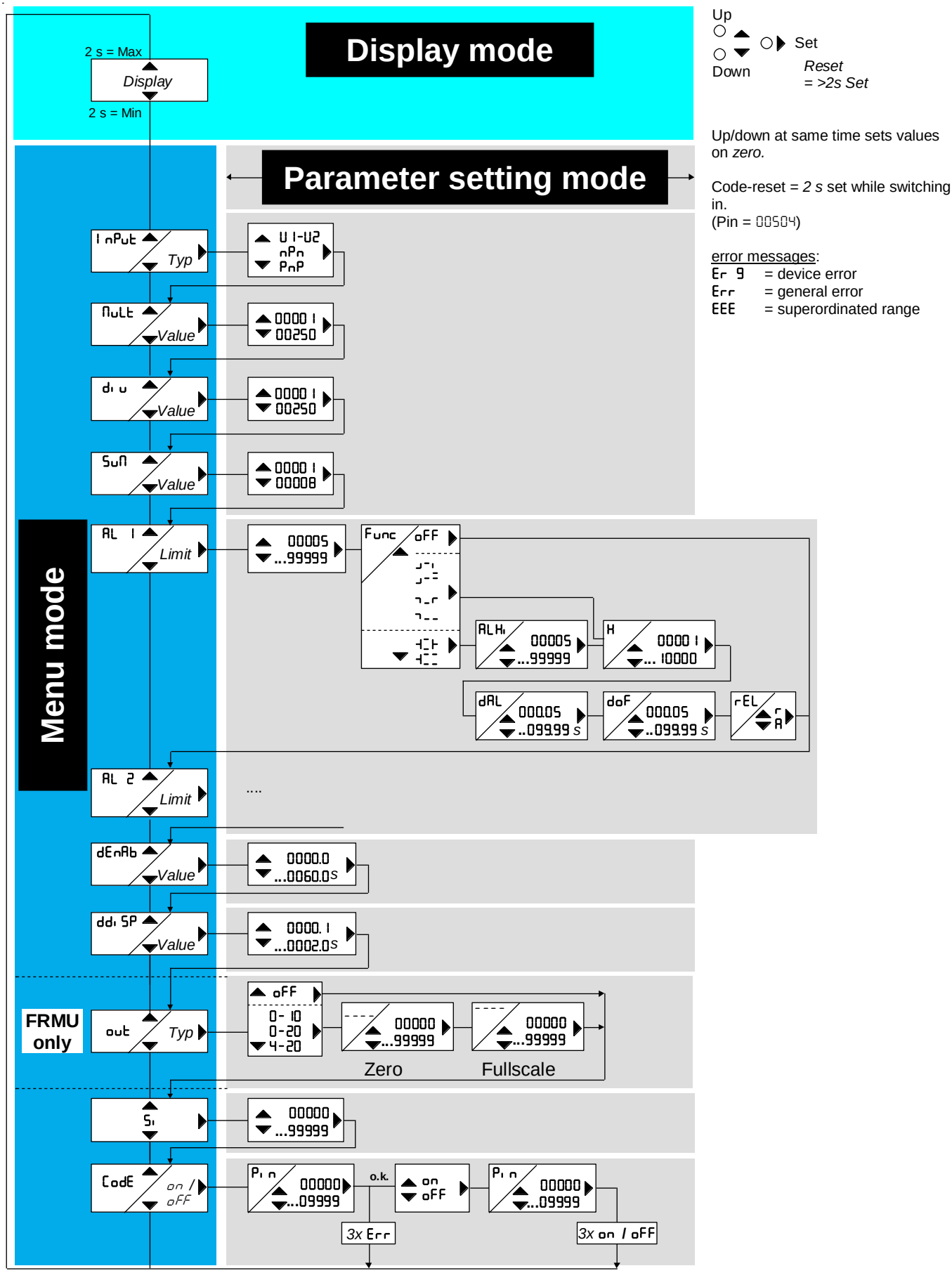
FRMU only:

out	analog output
0- 10	0...10 V voltage output
0/4-20	0/4...20 mA current output
----	value for 0 V, 0/4 mA at the output
----	value for 10 V, 20 mA at the output

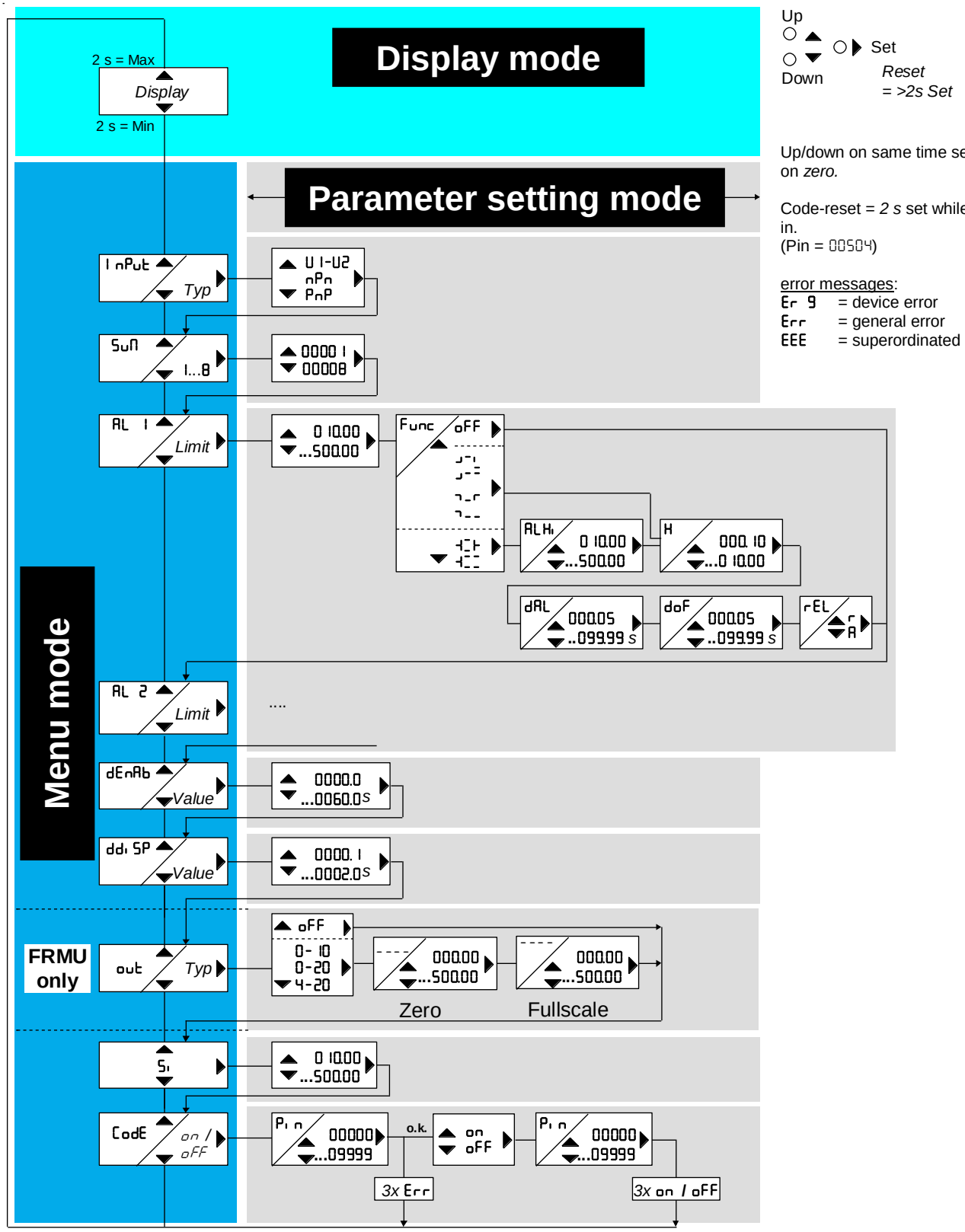
9 Operation

9.1 Program 1: Pr 1 / Speed Monitoring

Operation with pushbuttons:



Operation with pushbuttons:



Up
Down
Set
Reset
= >2s Set

Up/down on same time sets values on *zero.*

Code-reset = *2 s* set while switching in.
(Pin = 00504)

error messages:
Er 9 = device error
Err = general error
EEE = superordinated range

10 Factory setting

In case of programme change all parameters are set back on factory setting.

Menu-item	Parameter	Value		My data
		Pr 1	Pr 2	
InPut	Input type	PnP	U1-U2	
Mult	Multiplier	1	-	
diu	Divisor	1	-	
Sun	Mean value	4	4	
Alarm 1 AL 1	Limit 1 (lower window limit)	500	48.00	
	Func (Function)	n_r	HIL	
	ALHi (upper window limit)	-	52.00	
	H (Hysterisis)	10	1.00	
	dAL (Alarm-delay)	0.50	0.10	
	doF (Switch-back delay)	0.50	0.10	
	rEL (Relais function)	r	r	
Alarm 2 AL 2	Limit 2 (lower window limit)	5000	47.00	
	Func (Function)	uCL	HIL	
	ALHi (upper window limit)	-	53.00	
	H (Hysterisis)	100	1.00	
	dAL (Alarm-delay)	0.50	0.10	
	doF (Switch-back delay)	0.50	0.10	
	rEL (Relais function)	r	r	
dEnAb	Start-up-delay	2.0	0.1	
ddiSP	Display delay	0.5	0.5	
out (nur FRMU)	Type	0-10	0-10	
	____ (Zero)	0	0.00	
	---- (Fullscale)	5000	100.00	
CodE	on / oFF	oFF	oFF	
	Pin	00504	00504	

Indication of software version: push „Set“ 10 s in display mode.

11 Error search and measures

Device cannot be programmed – Code lock

The code lock gives protection against unauthorized manipulation of the device. When code lock is activated the parameters can not be changed. The pin can be typed in by the user.
Pin unknown? Make code-reset: When switching in supply-voltage keep pushed button „Set“ for **2 s**.
Display shows: "88888"; "CodE"; "oFF"; "88888" release button „Set“.
Code = oFF, Pin = 00504.

Indicated value does not correspond to input signal

Correct program chosen?
Input type (InPut) selected correct?
Multiplier and divisor programmed correct when monitoring speed (Pr 1)?

Indication „Erg“

Erg is an internal fault of the device. Switch off- and on the power-supply.
If after that there still is an error indicated, the unit must be sent to the factory for repair.

12 Technical data

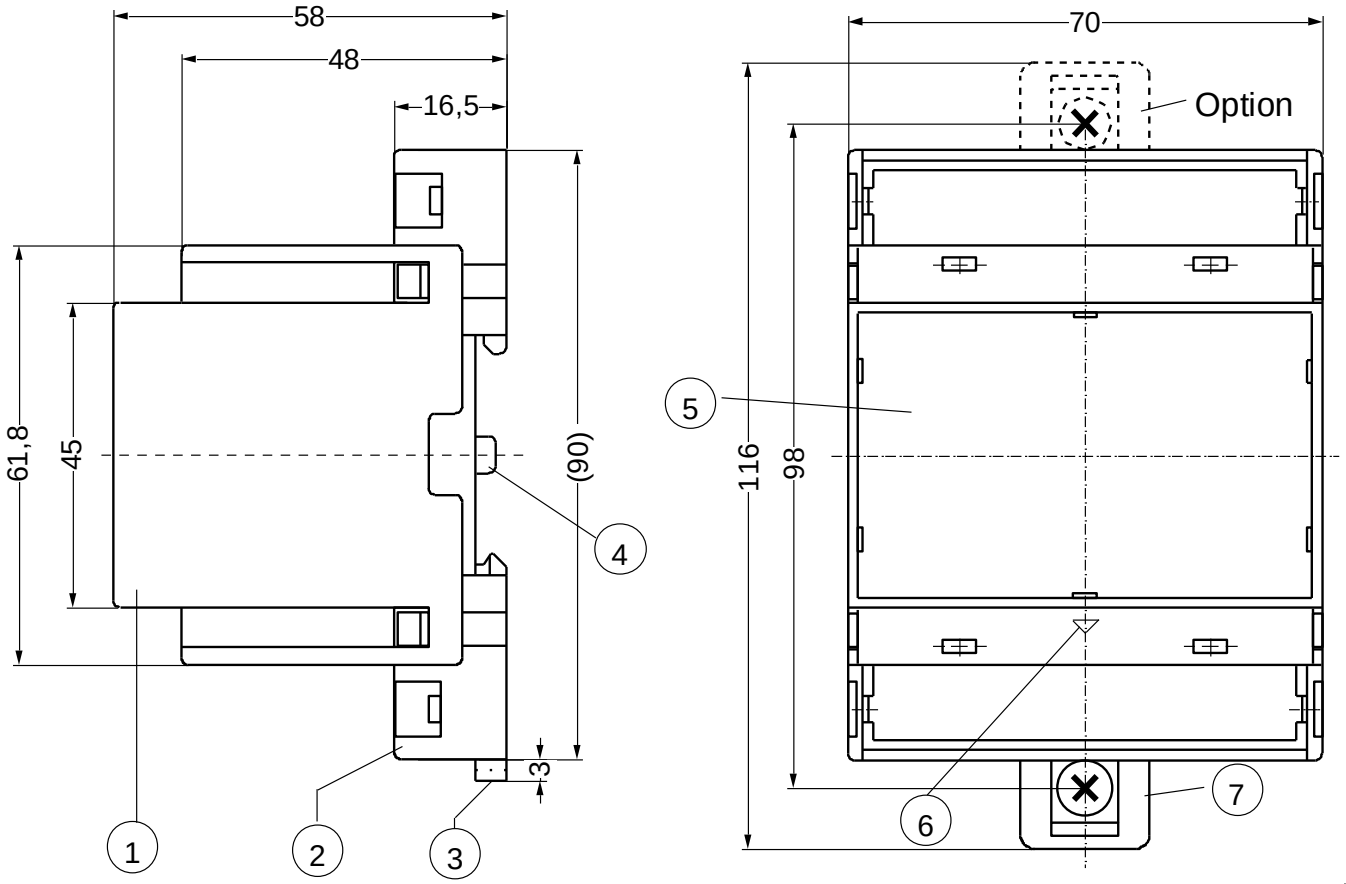
Rated supply voltage Us:	AC/DC 24 – 240 V
Tolerance	DC 20,4 - 297 V AC 20 - 264 V
Frequency	0, 40...500 Hz, from AC 80 V: 10...500 Hz
Input	< 3 W < 10 VA
Relay-output:	2 x 1 Changer (CO)
Switching voltage	max. AC 400 V
Switching current	max. 5 A
Switching power	max. 1250 VA (ohm resistive load) max. 48 W at DC 24 V
Nominal operating current Ie:	
AC15	Ie = 1,25 A Ue = 400 V Ie = 2 A Ue = 250 V
DC13	Ie = 2 A Ue = 24 V
Recommended fuse	T 3,15 A (gL)
Contact life mechanic	15 x 10^6 Switching cycles
Contact life electrical.	2 x 10^5 Switching cycles at AC 250 V / 3 A 5 x 10^5 Switching cycles at AC 250 V / 2 A 1 x 10^5 Switching cycles at AC 250 V / 0,8 A
Test conditions	EN 60255 / EN 60947
Rated impulse voltage	4000 V
- measuring input f-in	4000 V -> Order-number U226134 + U226135 6000 V -> Order-number U226138
Contamination level	2
Rated insulation voltage Ui	300 V
- measuring input f-in	300 V -> Order-number U226134 + U226135 600 V -> Order-number U226138
On-time	100 %
Permitted ambient air temperature	-20 °C ... +60 °C EN 60068-2-2 dry heat
Interference resistance	EN 61000-6-2
Interference transmission	EN 61000-6-3
Vibration resistance EN 60068-2-6	2…25 Hz ±1,6 mm 25 ... 150 Hz 5 g

Measuring inputs	
f-in -> Order-number U226134 + U226135	Frequency 10,00 ... 500,00 Hz • admissible voltage AC 20...200 V • admissible voltage AC 80...440 V
f-in -> Order-number U226138	Frequency 10,00 ... 500,00 Hz • admissible voltage AC 110...300 V • admissible voltage AC 210...830 V
Three wire - PNP	U_{Max} 28 V; switching threshold approx. 10 V
Three wire - NPN	18 V / 3,5 mA; switching threshold approx. 9 V
Two wire- proximity switch	18 V / 3,5 mA (24 V DC) Switching threshold approx. 1,5 mA
Switching frequency	max. 1,6 kHz; 99999 1/min
Cable length for proximity switch	PNP, NPN, 2-wire
Resistance of line	≤ 10 Ω / line
Capacity of line	≤ 22 nF 0…800Hz; ≤ 10 nF 800...1600 Hz
e.g. max. length of cable	< 150 m with cable LIFYY11Y 3*0,34 mm at 0…800Hz
Measuring error	± 0,05 % of measured value ± 1 Digit
Temperature factor	< 0,002 %/K
Measuring time	1 Period * ƽ∪ᑎ (number mean values) >= 3 Periods; after placing the measuring signal
Auxiliary supply +18 V 20 mA	16 ... 21 V max. 20 mA
Enable E1-E2	18 V / 3 mA Switching threshold approx. 9 V
Analogue output: (FRMU only)	electrically insulated to input f - in (U1-U2)
Voltage output 0...10 V	max. 10 mA error <0,1 % of full scale
Temperature factor	< 0,01 %/K
Current output 0/4...20 mA	max. 500 Ω error <0,15 % of full scale
Temperature factor	< 0,015 %/K
Error from burden	(250 Ω - resistance)/250 Ω * 0,15 % of final value
Housing	type V 4
Mounting height	55 mm
Width	4 TE
Dimensions	(W x H x D) 70 x 90 x 58 mm
Line connection solid wire	each 1 x 1,5 mm2
Stranded wire with insulated ferrules	each 1 x 1,0 mm2
Torque	0.5 Nm (3,6 lb.in)
Protection class housing	IP 30
Protection class terminals	IP 20
Fitting position	any
Mounting	Snap mounting on 35 mm standard rail EN 60 715 or M4 screws
Weight	app. 180g

Subject to technical changes

13 Type V4

Dimensions in mm



1 Cover
2 Base
3 Bar for snap mounting
4 Latch for sealing
5 Front panel
6 Position downward
7 For fixing to wall with screws, Ø 4,2 mm.

Sie finden diese und weitere Betriebsanleitungen, soweit verfügbar auch in englisch, auf unserer Homepage **www.ziehl.de**.

You find this and other operating-manuals on our homepage **www.ziehl.de**, as far as available also in English.